电源连接器设计

- 电源连接器简介
- 电源连接器温升
- 热量的传输方式与特性
- 连续电流和瞬间电流
- 电源端子的设计依据/标准
- 电流配送
- 电源连接器认证测试
- 连接器温升/载流能力分析(仿真)

数据,案例,图片,图示培训时提供

电源连接器简介

根据电流和电压对连接器进行分类:

大致分类:

信号端子,低电流低电压—一般小于1安几伏电压以内

电源端子/电源连接器,---高电流高电压

电源端子与电源连接器的区分:电源连接器的端子有两种类别:1,端子数量不多,每根端子的电流较高;2,端子数量很多,每根端子的电流不高

这两种端子的设计要求不一样.

精准分类:见下表

连接器的电压方面的性能决定于材料和具体应用的结构方式,应参考具体的相关规范

连接器的载流性能决定于材料参数和连接器设计,特别是正向力和电镀规格·

电源连接器的温升

电源端子往往标注所能承受的最大电压

定义最大电流的标准有一定随意性---见附表各种标准的差异

电源连接器的温升

历史上30° 温升的标准来源于UL对商用电子设备的认证程序,现在的UL标准不一定要求30° 温升.

UL认证是从安全角度考虑,故不能保证产品可靠性

UL认证的预处理较有限,EOL温升标准解决产品可靠性问题

30° 温升标准有一定局限性, 事实上不少连接器允许更高的温升和更大的电流.比较载流能力时需留意相关标准

比较载流能力时需留意:温升标准;测试条件(空气中或塑胶中);导体尺寸

预处理要求(如是否EOL)

温升概述:

连接器温升源于电阻产生的热量(焦耳热/I2R)与散热的平衡

与连接器相关的电阻有三:永久连接电阻;接触电阻;体电阻

散热有三种形式:传导; 对流; 辐射

在绝大多数应用中,辐射的散热效果不如对流和传导,但在pin数较多的电源连接器,辐射在pin中相互作用

对流决定于温度和端子周围流动的空气(这就是为什么在载流测试中测试条件对载流能力影响很大的原因).在多pin连接器中外壳的屏蔽作用会降低通过对流方式散热的能力

通过传导方式将热量传递到电线/电缆或pcb导线的能力决定于应用环境的温度,电线电缆导体,pcb导线的热传导性及导体的截面形状,长度.传导是电源端子的主要散热方式

电源连接器的温升

连接器电阻

在信号端子中，体电阻一般比永久连接电阻和接触电阻明显高出不少，体电阻在10毫欧的数量级而接触电阻是1毫欧，永久连接电阻是0.1毫欧的数量级，故在温升主要是体电阻引起的.

在电源端子中，必须使体电阻最小化以降低焦耳热和端子的电压降，这样体电阻和接触电阻的差异就减小了.在电源端子设计中必须分别考虑体电阻和接触电阻

体电阻

- 导电率
- 长度
- 截面积

电源连接器的温升

体电阻计算案例

1,用Excel计算体电阻

2,体电阻案例

分段计算法是大致的算法
有限元分析能提供精准的算法

电源连接器的温升

体电阻载流能力计算:

- 电阻率
- 热传导率
- 面积当量
- 散热系数:
  - 绝缘情况
  - 匹配性
  - 载荷系数

体电阻电压降的计算:

案例:
要求,电压降小于15mV
体电阻2.71mV
额定电流5A

电源连接器的温升

连接的匹配性:

若被连接的导体的载流能力与连接器的载流能力不匹配,将会影响连接器的载流能力:若被连接导体载流能力较大,该导体成为散热器,若被连接导体载流能力较小,该导体成为热源.

PCB导体载流能力如表

电源连接器的温升

接触电阻

分离界面触点超高温

触点间存在电压降, 各触点间的电压降相同
,
触点的电流决定于触点的大小, 触点的电流
很大
触点很小，热反应很快 – 在微妙数量级达
到热平衡, 导致局部高温.

电源连接器的温升

接触电阻

分离界面触点超高温

触点,触点分布/接触电阻/正向力的关系

电源连接器的温升

分离界面触点超高温 – 局部高温的计算

过高的局部高温会破坏触点及界面-接触电阻增大, 需加以管控. 局部超高温不能直接测量, 但通过界面电压降来计算

热量的传输与特性

热传导(conduction)

There are three mechanisms of heat transfer. These mechanisms are:

*Conduction *Convection *Radiation

In all three mechanisms, heat energy flows from the medium with higher temperature to the medium with lower temperature. Heat transfer by conduction and convection requires the presence of an intervening medium while heat transfer by radiation does not.

Conduction is the heat transfer mechanism in which thermal energy transfers from one point to another through the interaction between the atoms or molecules of the matter. Conduction occurs in solids, liquids, and gasses. Conduction does not involve any bulk motion of matter. Gases transfer heat by direct collisions between energetic molecules, and their thermal conductivity is low compared to solids since they are dilute media. The conduction of energy in liquids is the same as in gases except that the situation is considerably more complex since the molecules are more closely spaced and molecular force fields exert a strong influence on the energy exchange in the collision process. Nonmetallic solids transfer heat by lattice vibrations so there is no motion of the media as heat propagates through. Metals are better conductors than nonmetals at normal temperatures because they have free electrons that carry thermal energy.

热量的传输与特性

热传导(conduction)

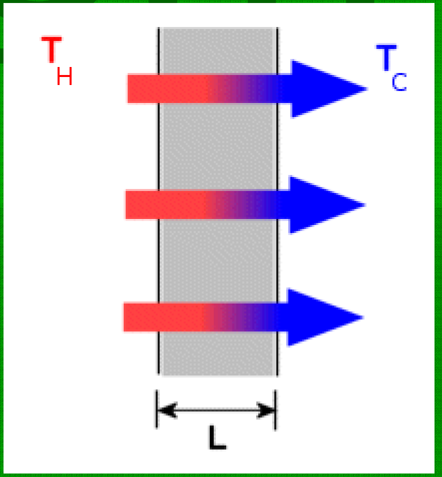
The heat transfer by conduction obeys Fourier's law which states that the rate of heat conduction Qconduction is proportional to the heat transfer area (A) and the temperature gradient (dT/dx), or:

$Qconduction = - K A (dT/dx)$

where K, the thermal conductivity, measures the ability of a material to conduct heat. The units of K are W/m.ºC or (Btu/s)/in.ºF. For the planar layer shown below, the rate of heat conduction is given by,

$Qconduction = - K A (TH - TC)/L$

材料直接传导热量的能力称为热传导率，或称热导率（Thermal Conductivity）。热导率定义为单位截面、长度的材料在单位温差下和单位时间内直接传导的热量。热导率的单位为瓦每米每开尔文（(W/m.K)）。
导热系数为在稳定传热条件下，1m厚的材料，两侧表面的温差为1度（K,° C）,在1秒内，通过1平方米面积传递的热量，用λ表示，单位为瓦/米·度（W/(m·K),此处的K可用℃代替）。[

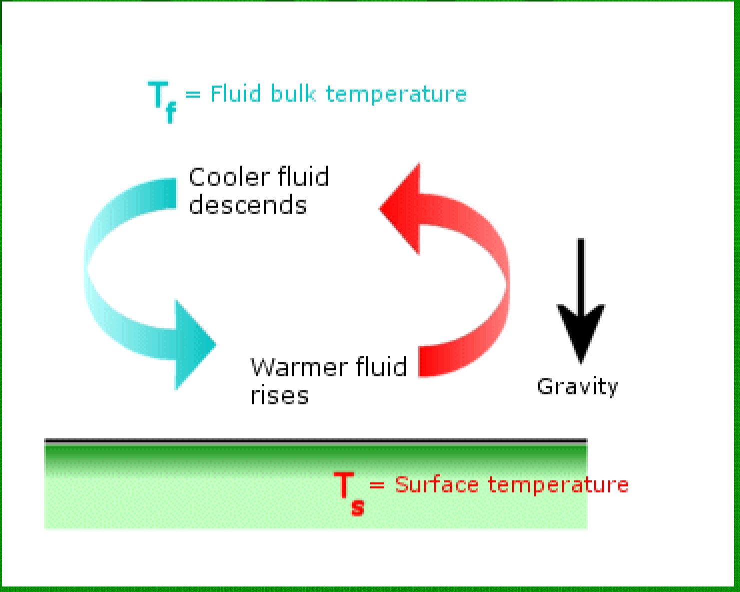


热量的传输与特性

对流(convection)

Convection is the heat transfer mode in which heat transfers between a solid face and an adjacent moving fluid (or gas). Convection has two elements:
Energy transfer due to random molecular motion (diffusion), and
Energy transfer by bulk or macroscopic motion of the fluid (advection).
The mechanism of convection can be explained as follows: as the layer of the fluid adjacent to the hot surface becomes warmer, its density decreases (at constant pressure, density is inversely proportional to the temperature) and becomes buoyant. A cooler (heavier) fluid near the surface replaces the warmer fluid and a pattern of circulation forms.

The rate of heat exchange between a fluid of temperature Tf and a face of a solid of area A at temperature Ts obeys the Newton's law of cooling which can be written as:
Qconvection = h A (Ts - Tf)
where h is the convection heat transfer coefficient. The units of h are W/m2.K or Btu/s.in2.F. The convection heat transfer coefficient (h) depends on fluid motion, geometry, and thermodynamic and physical properties.



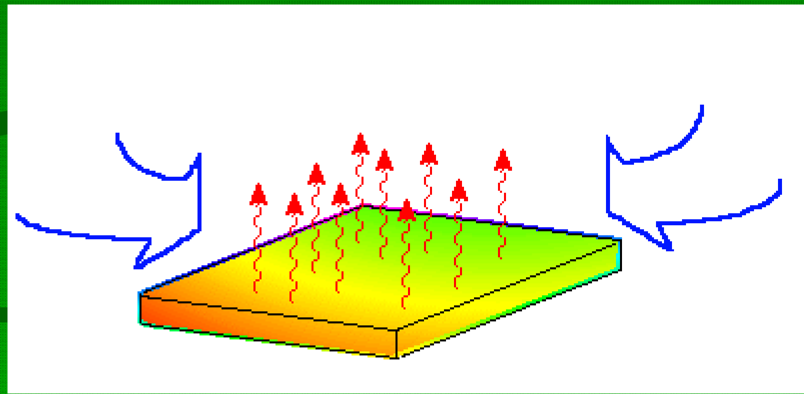
热量的传输与特性

对流(convection)

Generally, there are two modes convection heat transfer:

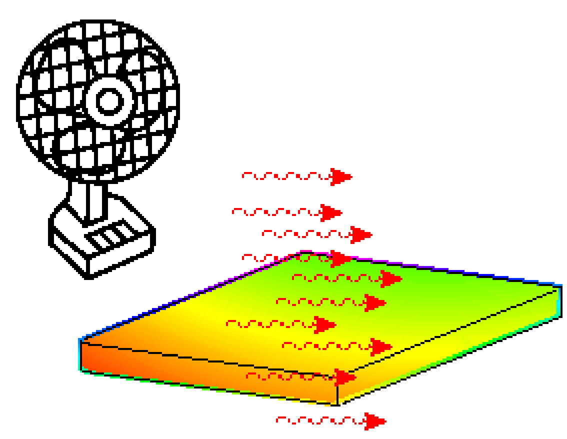
Natural (Free) Convection

The motion of the fluid adjacent to a solid face is caused by buoyancy forces induced by changes in the density of the fluid due to differences in temperature between the solid and the fluid. When a hot plate is left to cool down in the air the particles of air adjacent to the face of the plate get warmer, their density decreases, and hence they move upward.



Forced Convection

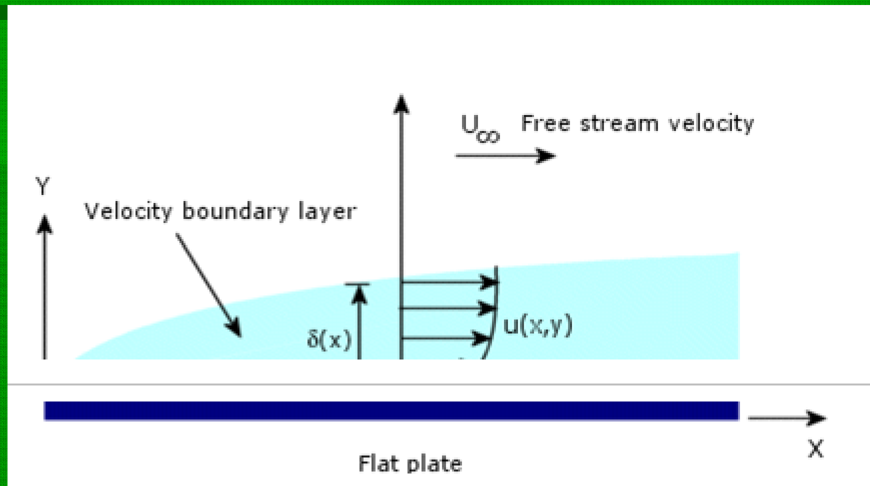
An external means such as a fan or a pump is used to accelerate the flow of the fluid over the face of the solid. The rapid motion of the fluid particles over the face of the solid maximizes the temperature gradient and increases the rate of heat exchange. In the following image, air is forced over a hot plate.



热量的传输与特性
对流(convection)

Newton's law of cooling states that the heat transfer rate leaving a surface at temperature Ts into a surrounding fluid at temperature Tf is given by the equation:
Qconvection = h A (Ts - Tf)
where the heat transfer coefficient h has the units of W/m2.K or Btu/s.in2.F. The coefficient h is not a thermodynamic property. It is a simplified correlation to the fluid state and the flow conditions and hence it is often called a flow property.
Convection is tied to the concept of a boundary layer which is a thin layer of transition between a surface that is assumed adjacent to stationary molecules and the flow of fluid in the surroundings. This is illustrated in the next figure for a flow over a flat plate.

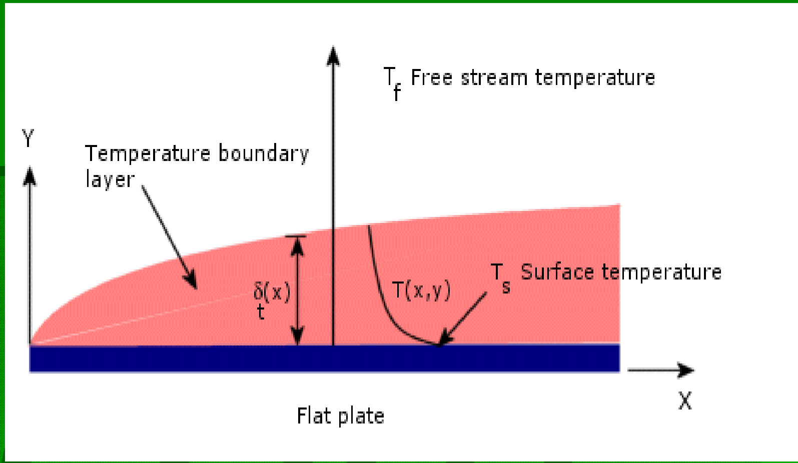
Where u(x,y) is the x-direction velocity. The region up to the outer edge of the fluid layer, defined as 99% of the free stream velocity, is called the fluid boundary layer thickness δ (x).



热量的传输与特性

对流(convection)

A similar sketch could be made of the temperature transition from the temperature of the surface to the temperature of the surroundings. A schematic of the temperature variation is shown in the next figure. Notice that the thermal boundary layer thickness is not necessarily the same as that of the fluid. Fluid properties that make up the Prandtl Number govern the relative magnitude of the two types of boundary layers. A Prandtl Number (Pr) of 1 would imply the same behavior for both boundary layers.



The actual mechanism of heat transfer through the boundary layer is taken to be conduction, in the y-direction, through the stationary fluid next to the wall being equal to the convection rate from the boundary layer to the fluid. This can be written as:

$h A (T_s - T_f) = - k A (dT/dy)_s$

Thus the convection coefficient for a given situation can be evaluated by measuring the heat transfer rate and the temperature difference or by measuring the temperature gradient adjacent to the surface and the temperature difference.

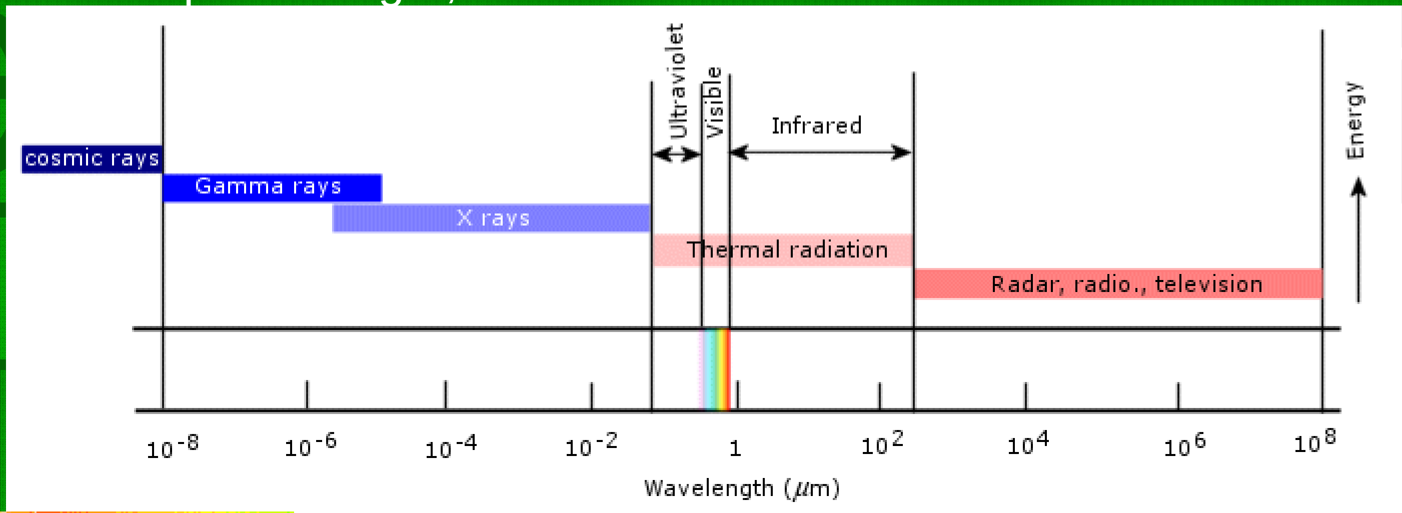
Measuring a temperature gradient across a boundary layer requires high precision and is generally accomplished in a research laboratory. Many handbooks contain tabulated values of the convection heat transfer coefficients for different configurations.

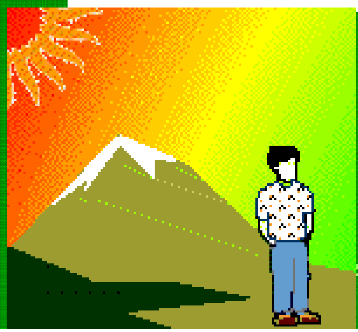
热量的传输与特性

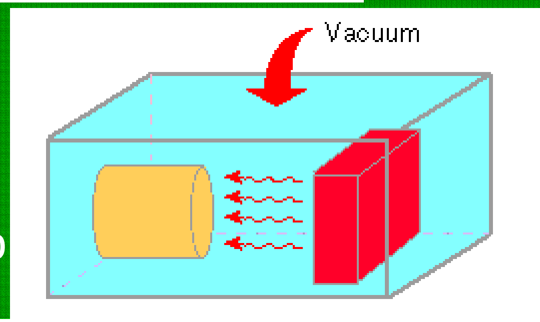
辐射(radiation)

Thermal radiation is the thermal energy emitted by bodies in the form of electromagnetic waves because of their temperature. All bodies with temperatures above the absolute zero emit thermal energy. Because electromagnetic waves travel in vacuum, no medium is necessary for radiation to take place. The following figure shows the range, in wavelength, of thermal radiation compared to radiation emitted by other means (X-rays, γ -rays, cosmic rays, etc).

The thermal energy of the sun reaches the earth by radiation. Because electromagnetic waves travel at the speed of light, radiation is the fastest heat transfer mechanism.







热量的传输与特性

辐射(radiation)

Stefan-Boltzmann law states that the total emissive power of a blackbody, Eb, is given by: Eb = σ T4

where σ is the stefan-Boltzmann constant and T is the absolute temperature of the blackbody. The value of the Stefan-Boltzmann constant is 5.67x10-8 W/m2 K4 or 3.3063 x 10-15 Btu/s.in2.F4. The spectral variation of blackbody radiation is described by the Planck distribution . Integrating the Planck distribution law over all wavelengths (λ) gives the Stefan-Boltzmann law.

When a blackbody of a surface area (A) is immersed in a medium with ambient temperature Ta, the net rate of heat radiated by the blackbody is given by:

Qradiation = σ A (Ts4 - Ta4), Ts> Ta .

where: Ts = Absolute temperature of the blackbody Ta = Absolute temperature of the surrounding medium (ambient temperature)

The Stefan-Boltzmann law for the net rate of heat exchange by radiation between a blackbody and a surrounding medium should be modified for real surfaces. For non-blackbody surfaces, the spectral radiation intensity does not obey the Planck distribution and the emitted radiation has preferred direction for emission.

The modified Stefan-Boltzmann law for a non-blackbody is given by:

Qradiation = ε σ A (Ts4 - Ta4)

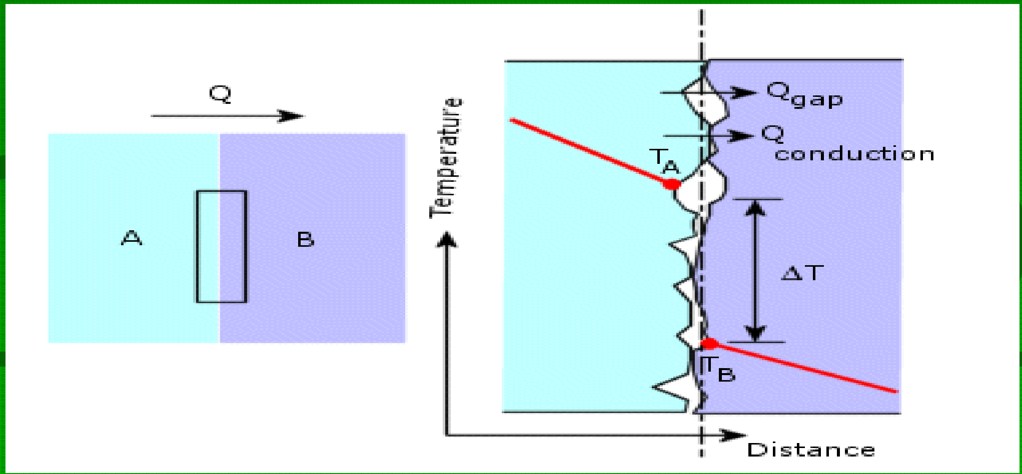
where e is the emissivity of the radiating surface defined as the ratio of the emissive power of the surface to the emissive power of a blackbody at the same temperature. Materials are assigned an emissivity value between 0 and 1.0. A blackbody, therefore, has an emissivity of 1.0 and a perfect reflector has an emissivity of 0.

The emissivity is a material property that is dependent on the surface temperature and the surface finish.

热量的传输与特性

热阻(thermal contact resistance)

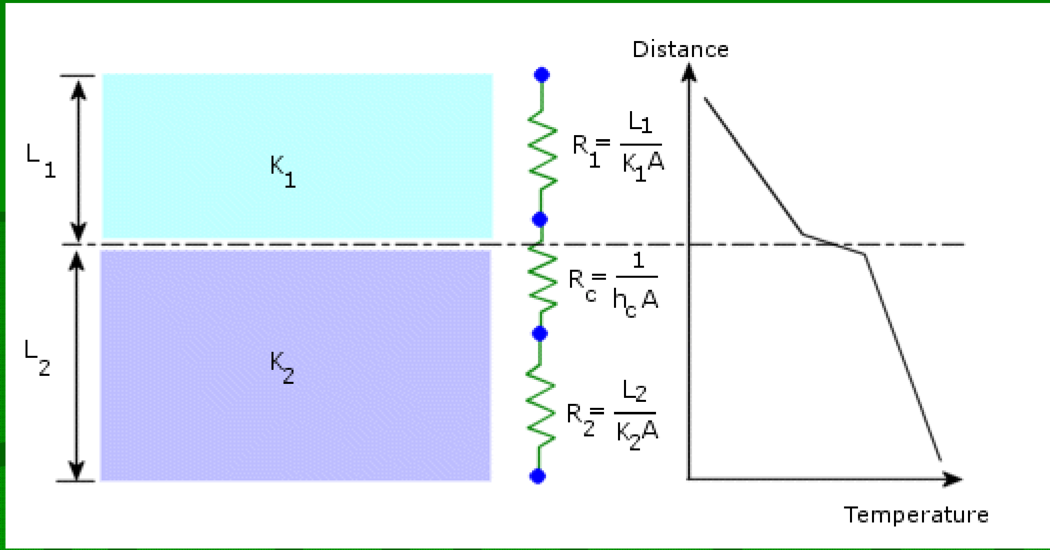
The usefulness of the analogy between the flow of electric current and the flow of heat becomes apparent when a satisfactory description of the heat transfer at the interface of two conducting media is needed. Due to machining limitations, no two solid surfaces will ever form a perfect contact when they are pressed together. Tiny air gaps will always exist between the two contacting surfaces due to their roughness.



Through the interface between the two contacting faces, two modes of heat transfer exist. The first is conduction through points of solid-to-solid contact (Qconduction) which is very effective. Secondly, conduction through the gas filled gaps (Qgap) which, due to its low thermal conductivity, can be very poor. To treat the thermal contact resistance, an interfacial conductance, hc, is placed in series with the conducting media on both sides as shown in the next figure.

热量的传输与特性

热阻(thermal contact resistance)



The conductance hc is similar to the convection heat transfer coefficient and has the same units (W/m2 ºK). If ΔT is the temperature difference across an interface of area A, then the rate of heat transfer Q is given by Q = A hc ΔT. Using the electrical-thermal analogy, you can write Q = ΔT/Rt, where Rt is the thermal contact resistance and is given by Rt = 1/(A hc).

The interfacial conductance, hc, depends on the following factors:

The surface finish of the contacting faces.

The material of each face.

The pressure with which the surfaces are forced together.

The substance in the gaps between the two contacting faces.

连续电流和瞬间电流

连续电流是端子在产品寿命期间正常工作时的电流.

瞬间电流和过载电流在本质上是断断续续的

连续电流是基于一定温升标准(如30°)

瞬间电流不应使界面熔化

过载电流应视应用情况而定

右图热平衡的时间取决于具体的应用,可能几秒钟或几分钟

连续电流和瞬间电流

瞬间电流,过载电流及连续电流案
例-电动机启动过程

连续电流和瞬间电流

最大瞬间电流决定于界面金属的熔化温度. 各镀层金属的最大瞬间电流与接触电阻的关系如下表

过载电流不应引起过大的焦耳热.
对于较好的设计, 一秒内的十倍于额定电流的过载电流是可接受的.
超过10秒的过载电流需做温升测试.

电源端子的设计依据/标准

体电阻电流的设计依据:温升和电压降

界面电阻电流的设计依据:如下(安全系数较高)

界面超高温与界面电压降的关系

电源端子的设计依据/标准

电源端子的设计依据/标准

如何降低体电阻：
高导电率材料；
大截面积
短路径

电源端子的设计依据/标准

界面最大载流能力决定于接触电阻,各种规格的镀层接触电阻与正向力的关系如右图

电源端子的设计依据/标准

多接触点设计

有利于降低接触电阻:
电阻与正向力不是线性关系,当正向力达到一定水平(电源连接器要求较大正向力),接触电阻下降较慢
– 接触电阻与正向力的平方根成正比(正向力下降4倍接触电阻下降2倍)
有利于提高可靠性:
通过额外(Through redundancy)接触,提高安全系数. 如8点接触设计,一点异常,接触电阻仅增大1.14倍
有利于提高插拔寿命:
多接触点设计有利于在较小的正向力实现较小的接触电阻,正向力的减小能提高插拔寿命
有利于降低正向力:
当正向力增大到一定程度,摩擦系数增大(见相关培训).在较小正向力,摩擦系数减小,更为有效降低正向力

电流分配

专用/分立端子法

局限:尺寸(端子与电线导体-)大小,空间受限.优势:结构简单,分析简便

电线大小影响端子的载流能力---匹配性(derating for wire gauge)

电流分配

降额曲线

温升是决定载流能力的重要因素, 当允许的温升范围减小时 – 应用的环境温度升高时 – 产品允许的最高温度与工作环境温度的差值减小, 产品的载流能力减小.

电流分配

降额曲线

即使相同的导体面积,不同的截面结构(圆VS矩形)对载流能力也会产生影响.

电流分配

降额曲线

Some connectors utilize wide, flat blade contacts. The thicker copper reduces resistance to allow higher amperage. And the flat surfaces dissipate heat better than pin and socket designs.

The cross-sectional area of blades maximizes electrical interface surface area and improves heat dissipation
Blades allow the use of more rugged copper and brass alloy contacts that are capable of carrying more current
Blades are also stronger and less susceptible to damage during mating or environmental stresses

电流分配

空气的散热对载流能力的影响

Few thermal management techniques improve power performance like airflow.

The table below suggests the performance benefits of airflow. Note how current capacity changes under varying cfm and lfm of airflow.

The same connector, under the same voltage, carries 63% more current with the aid of airflow. With heat-related resistance reduced, the power supply and connectors can do more work. Low profile connector is developed to maximize connector current carrying capacity.

CFM

Cubic feet per minute,

which is a measure of airflow volume.

LFM

Linear feet per minute,

which is a measure of airflow velocity.

电流分配

并联端子法

优势:更大的空间选择,组合出更多的电流应用规格. 局限:端子间热影响;电流分配的变异;信号端子密度降低.

并联端子电流降额:端子间热量影响 – 决定于端子空间/密度与相对位置

电流分配

并联端子法

并联端子电流降额:端子间热影响所致 – 决定于端子空间/密度与相对位置

一定端子,塑胶外壳结构和材料

电流分配

并联端子法

并联端子电流降额:

端子间热影响 – 决定于端子空间/密度与相对位置

一定端子,塑胶外壳结构和材料

电流分配

并联端子法

并联端子电流降额:电流分配所致 – 决定于分配电路,端子体电阻,接触电阻

分配电路: pcb导线电阻差异;电缆长度差异
体电阻差异: 长度不一致,如弯式结构端子
接触电阻: 正向力变异

热插拔的危害:弧光放电-界面破坏
热插拔的措施:长短端子结构

电源连接器设计的完整性

Power integrity is the discipline of maintaining high quality power delivery and distribution in spite of these constraints. Achieving power integrity requires attention to the following design issues:

- Modeling the connector solution in its environment
- Balancing connector size and profile with density and current rating
- Designing and manufacturing contacts for optimum electrical energy transfer
- Choosing connector materials to maximize conductivity while maintaining spring over time
- Managing the thermal environment, with particular attention to airflow

Power integrity is all about managing heat—not just through and around the connector, but for the thermal environment of the entire system, including the PCB itself.

The key factors that impact heat management and therefore power integrity are

- airflow;
- connector copper mass;
- contact design and production;
- contact material selection;
- pcb copper thickness

电源连接器设计的完整性

AIRFLOW indicates how much air flows through and around the connector and other components. Airflow cools system component, lowering resistance and allowing them to do more work.

COPPER THICKNESS or copper weight indicates how much copper is used on the PCB. As with conductors in general, more copper reduces resistance, and greater surface area dissipates heat better.

CONNECTOR COPPER MASS is the measure of how much copper is used in the connector. More copper offers less resistance. And more surface area, particularly width, dissipates heat better.

CONTACT DESIGN pays particular attention to maximizing electrical contact area. Doing so minimizes heat and heat-related resistance.

CONTACT MATERIAL is chosen carefully to strike an appropriate balance between electrical and mechanical properties. More copper means greater conductivity, but other metals may be alloyed for spring and strength.

COPPER THICKNESS or copper weight indicates how much copper is used on the PCB. As with conductors in general, more copper reduces resistance, and greater surface area dissipates heat better.

电源连接器设计

插拔力问题

In addition to electrical selection criteria, any of several mechanical issues may affect the customer's choice of a power solution.

First among them is engagement force. Also called mating force, it is the mechanical pressure required to mate a pair of connectors.

Engagement force is expressed in pounds per circuit. However, customers care more about total engagement force, which is the sum of the engagement forces of all contacts

Engagement force can be an ergonomic health concern; for example, for line workers who must repeatedly mate connectors. For board-to-board connectors, excessive engagement force risks potential damage to circuit boards and board component solder joints.

电源连接器设计

电源连接器的选择

When choosing a power connector for an application, several selection criteria should be considered. The criteria are:

- Current rating
- Price per circuit
- Agency approvals
- Operating voltage
- Connector size
- Engagement force
- Wire size
- configuration

电源连接器设计

电源连接器的选择

Selection criteria can be categorized into the three sets of more specific questions shown here.

Electrical questions:

What is the total current requirement(supply and return)

What is the ideal number of current paths(power blades)

What is the maximum allowable voltage drop

Are signal pins needed? How many

Is there a connector maximum height requirement

PCB question:

How many pcb layers and what is the amount of copper per layer(2,4oz)

What is the pcb thickness

How much linear board space is available on the card edge

What is the mounting preference: solder tail or press fit

Other question:

What T-Rise temperature is required

Is hot plugging needed

What is the airflow situation around the connector

What is the connector orientation-perpendicular or coplanar

Is this a single connector or a two-piece solution

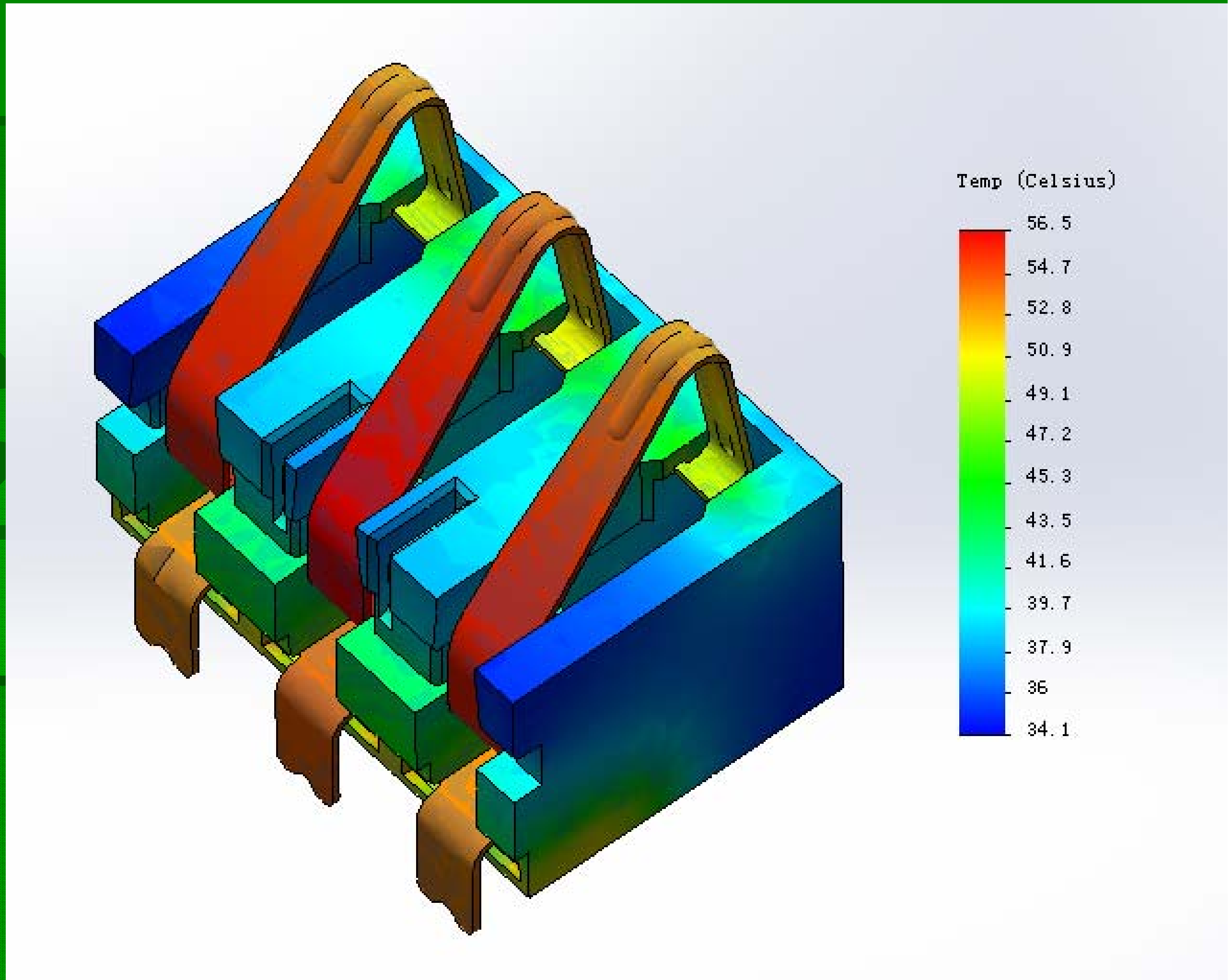
电源连接器/端子认证

与常规认证 不同之处: 不分组(分别)测试机械性能,电气性能,环境性能,而是测试前将样品进行EOL处理.

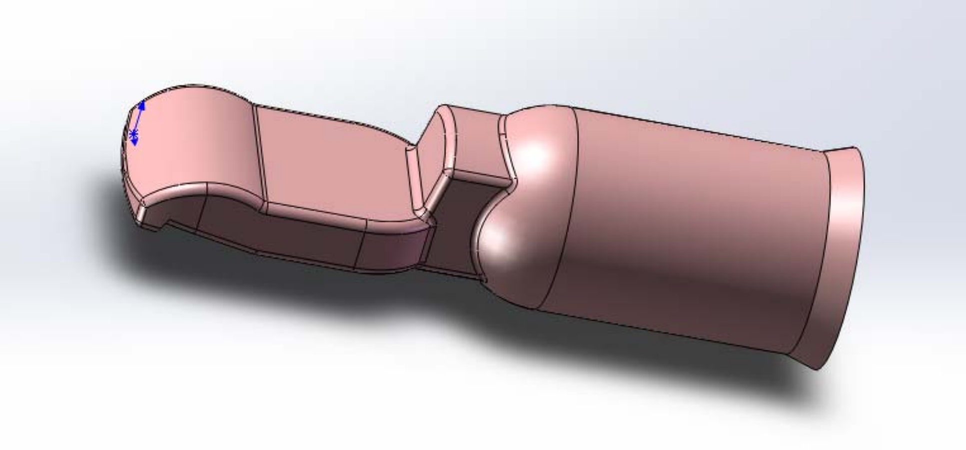
连接器温升/载流能力分析(仿真)

Thermal analysis calculates the temperature distribution in a body due to some or all of these mechanisms.

Conduction
Convection
Radiation



电源连接器设计



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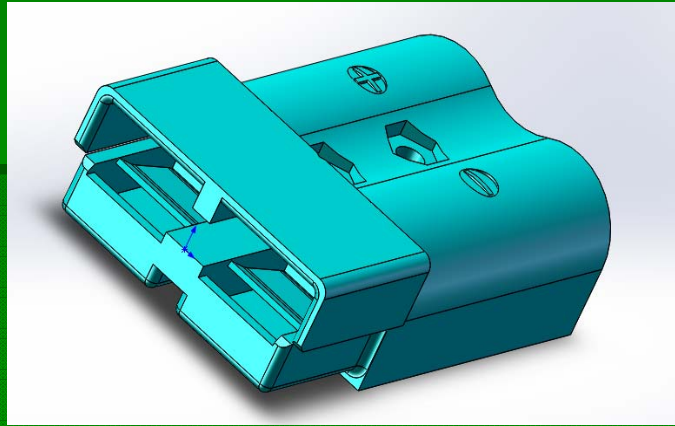
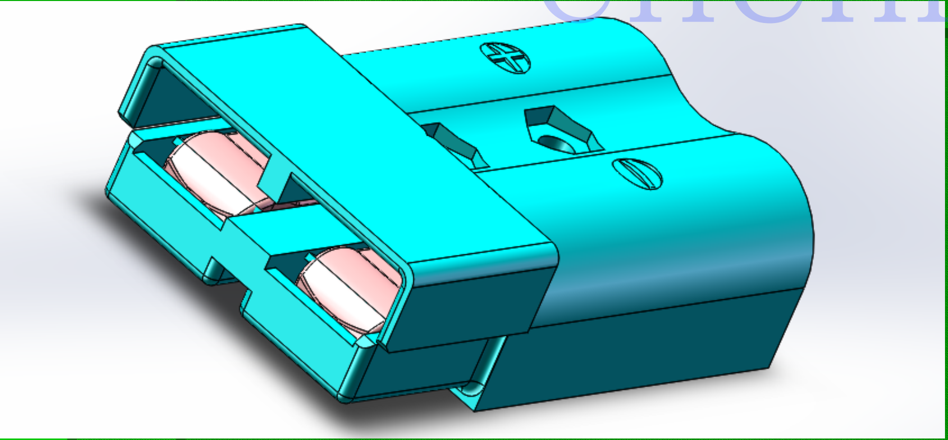
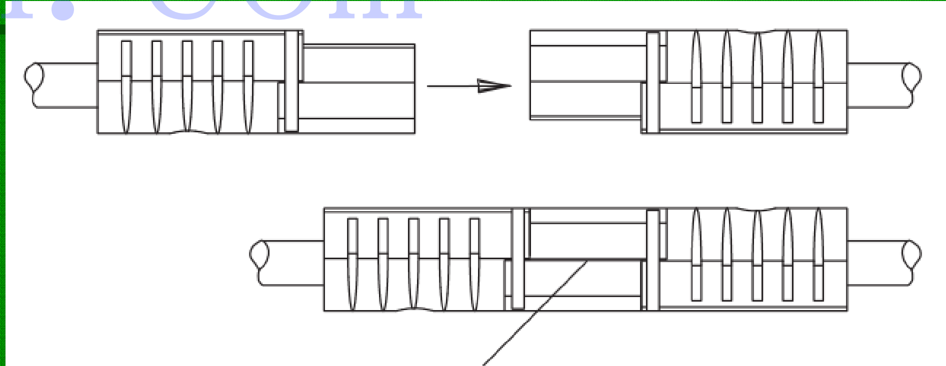
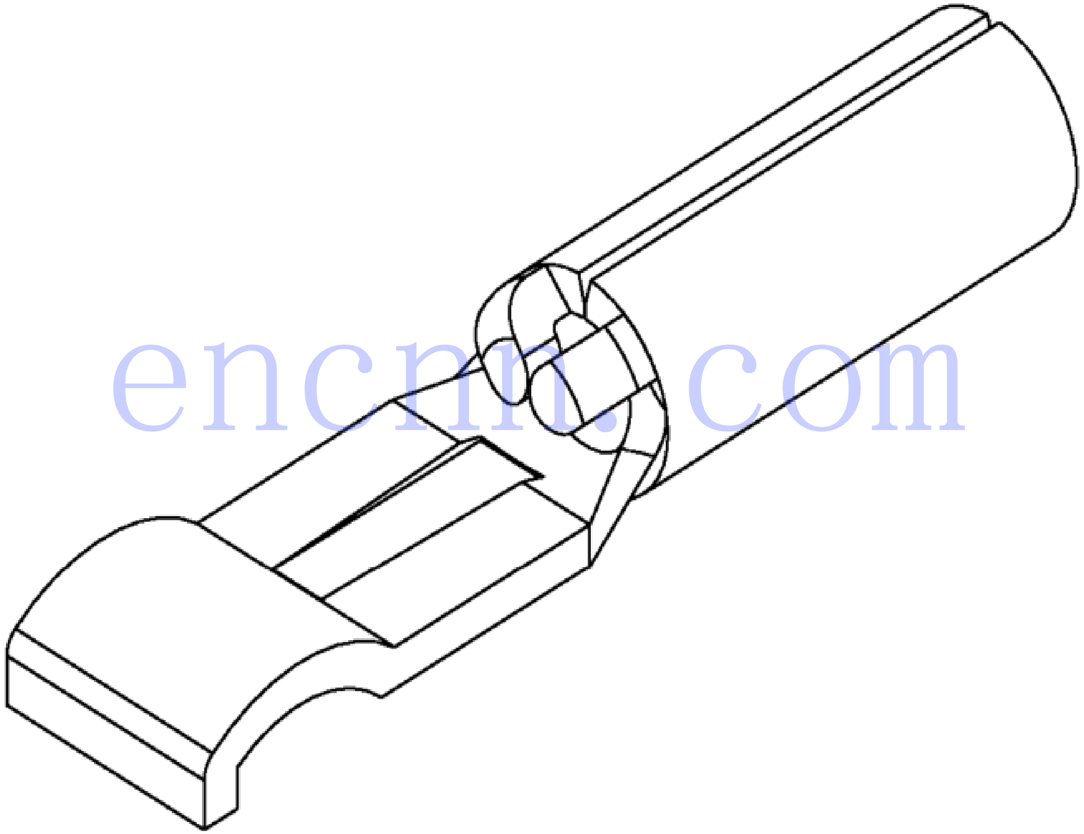


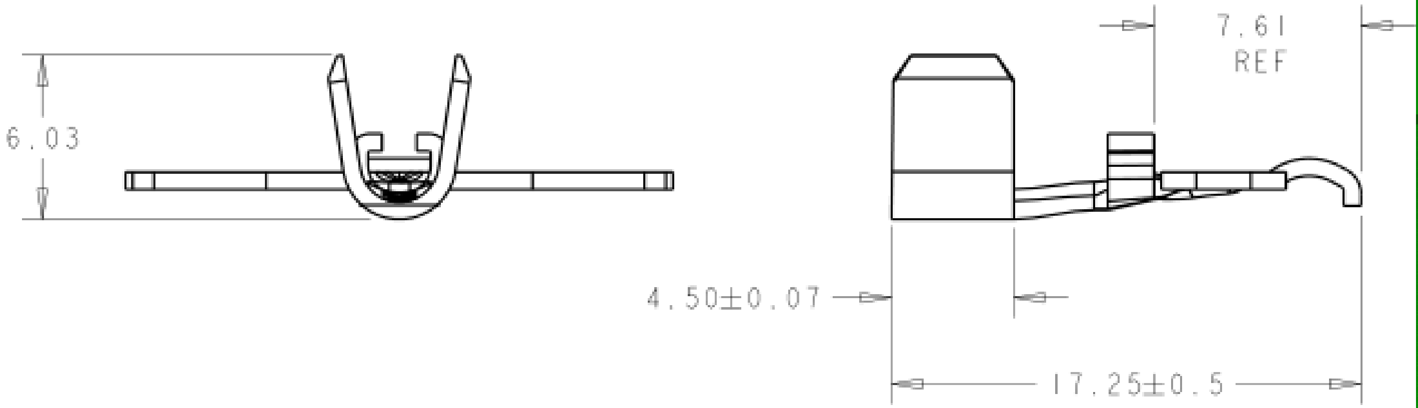


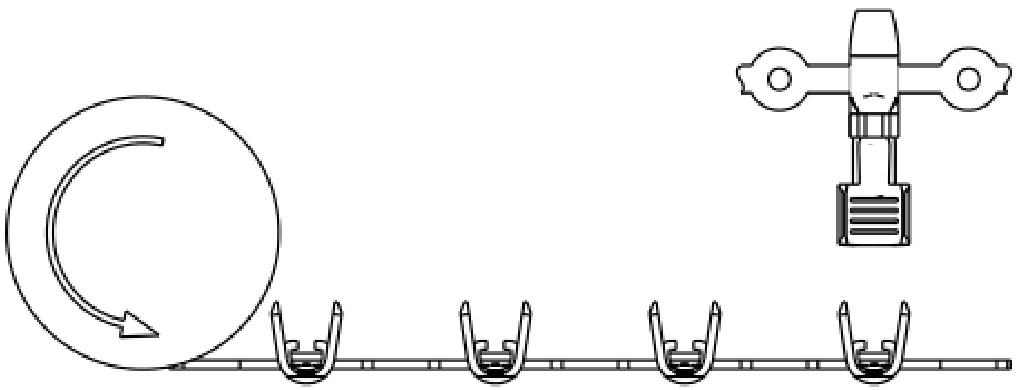


电源连接器设计

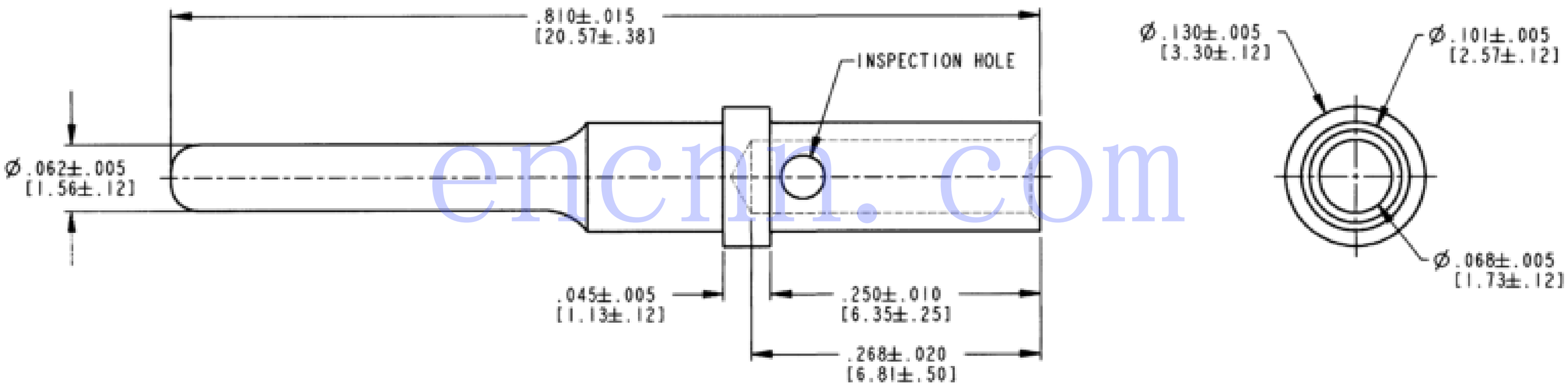


电源连接器设计



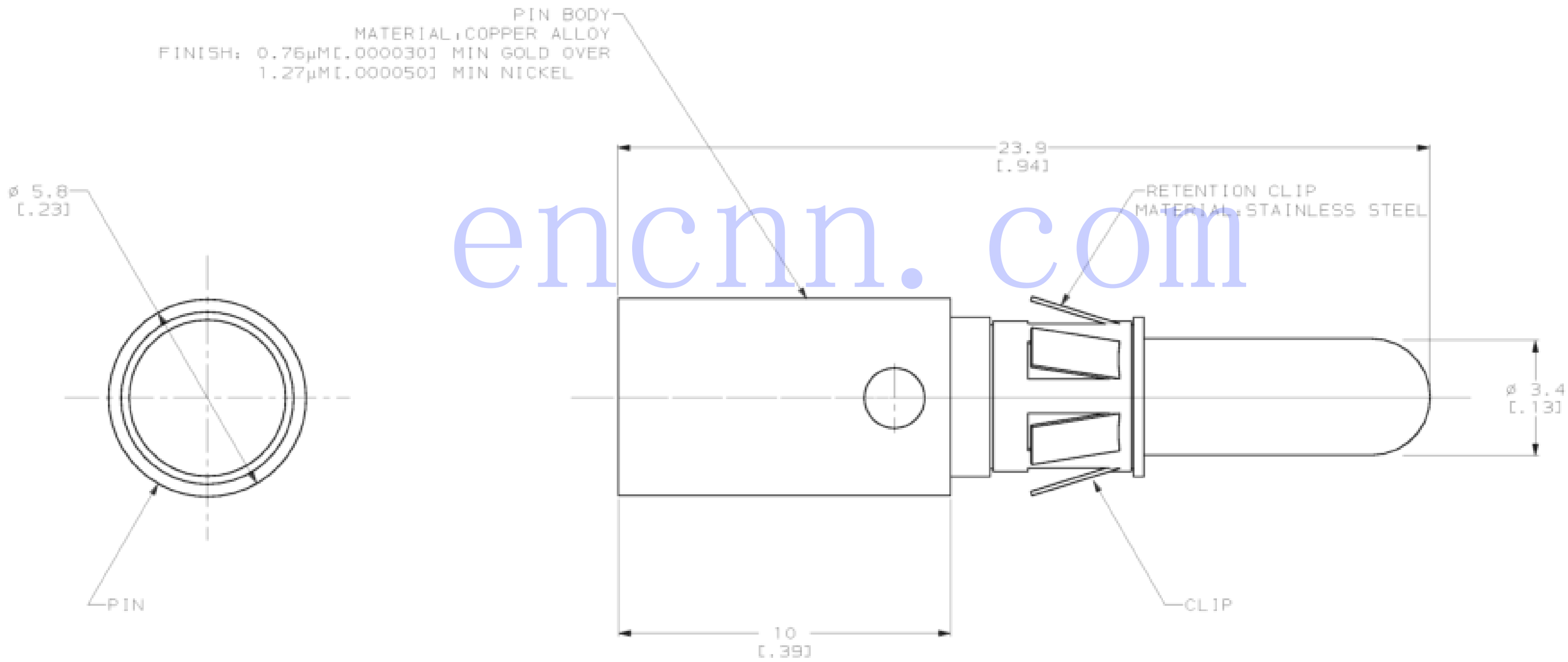


电源连接器设计

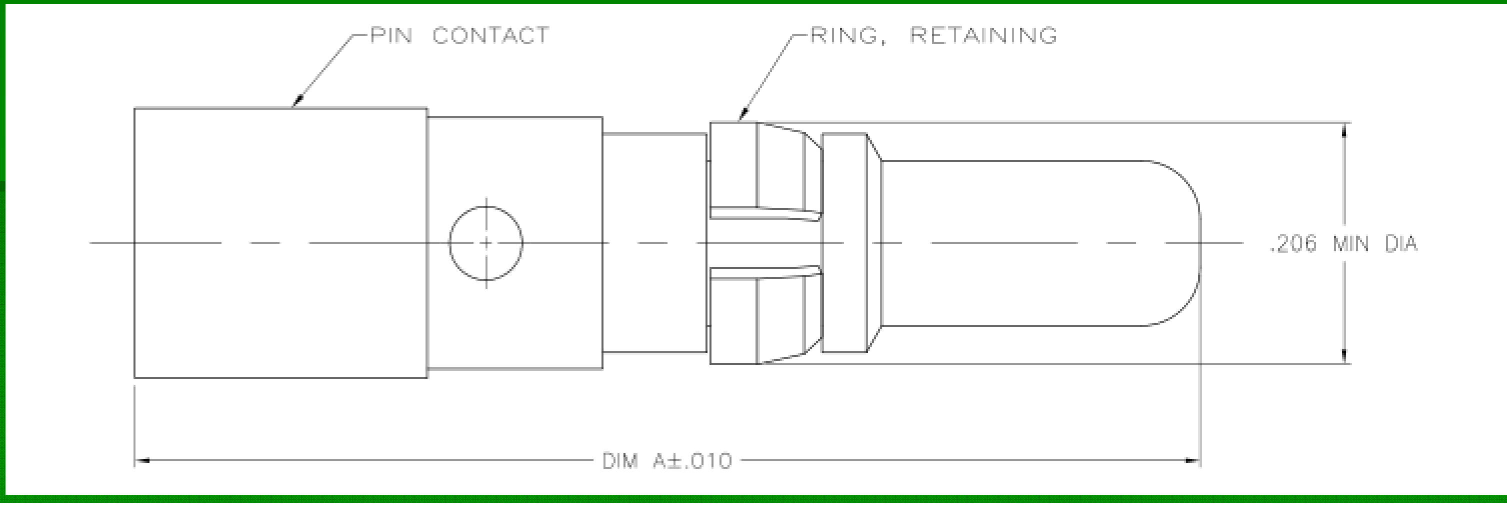

.810±.015
[20.57±.38]
INSPECTION HOLE
Ø.062±.005
[1.56±.12]
.045±.005
[1.13±.12]
.250±.010
[6.35±.25]
.268±.020
[6.81±.50]
Ø.130±.005
[3.30±.12]
Ø.101±.005
[2.57±.12]
Ø.068±.005
[1.73±.12]

电源连接器设计

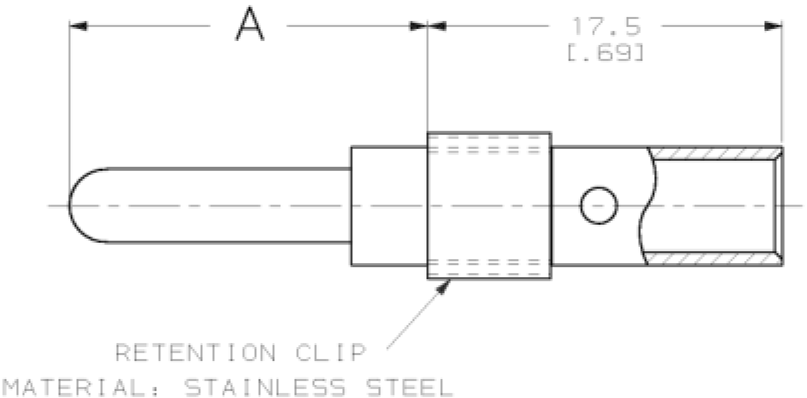
1. RETROFIT CONTACT FOR METRIMATE AND AMPLIMITE POWER CONTACT.
2. WIRE BARREL WILL ACCEPT #8 AWG WIRE.

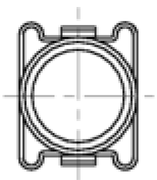


电源连接器设计



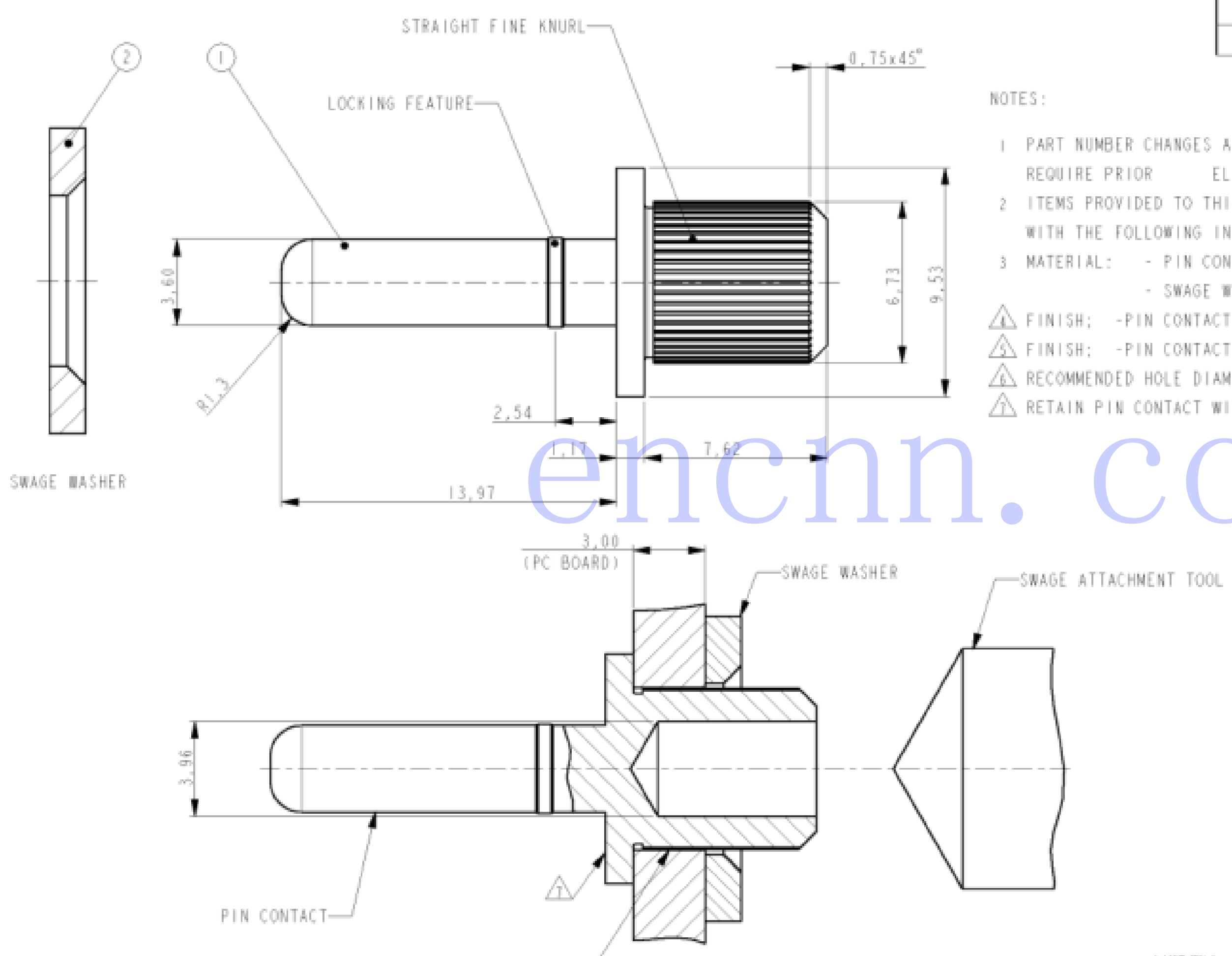
1. MATERIAL: COPPER ALLOY
2. FINISH: 30 MICROINCHES MIN. GOLD OVE
   MICROINCHES MIN. NICKEL.
3. WIRE BARREL WILL ACCEPT #8 AWG WIRE





连接器设计培训系列

电源连接器设计



NOTES:

1 PART NUMBER CHANGES AND/OR DESIGN CHANGES AFFECTING ITEM INTERCHANGEABILITY REQUIRE PRIOR ELECTRONICS APROVAL AND AUTHORIZATION BY REVISION TO THIS DRAWING.

2 ITEMS PROVIDED TO THIS SPECIFICATION SHALL BE IDENTIFIED ON THE CONTAINER. WITH THE FOLLOWING INFORMATION: PART NUMBER&DATE CODE OF MANUFACTURE.

3 MATERIAL: - PIN CONTACT : COPPER ALLOY
- SWAGE WASHER : STEEL.

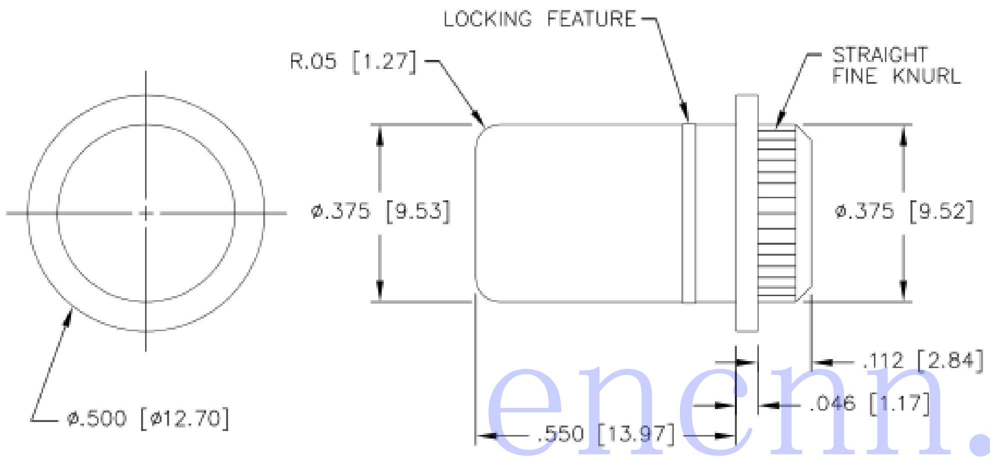
4 FINISH; -PIN CONTACT: SILVER 5,0μ MIN THK. OVER NICKEL 1,0μ MIN. THK.

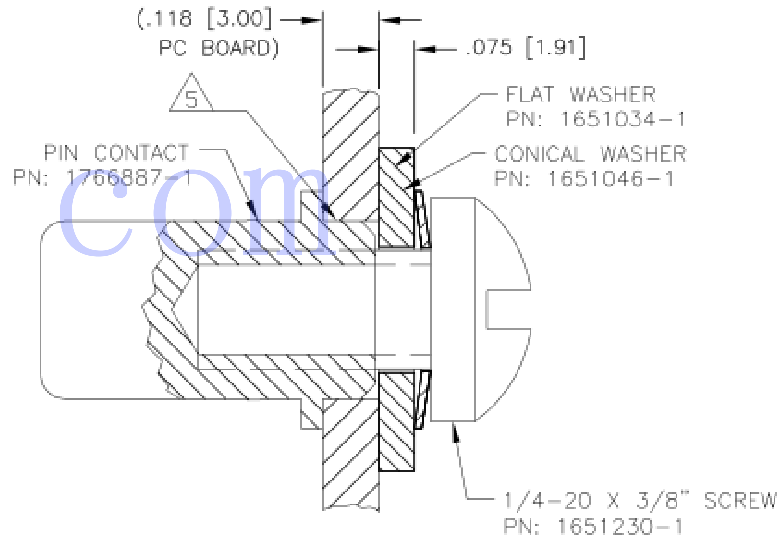
5 FINISH; -PIN CONTACT: GOLD 0,5μ MIN THK. OVER NICKEL 1,0μ MIN. THK.

6 RECOMMENDED HOLE DIAMETER AFTER PLATING: ø6,60 +0,07 / -0,03

7 RETAIN PIN CONTACT WITH SUPPORT TOOL BEFORE SWAGE OPERATION.

电源连接器设计



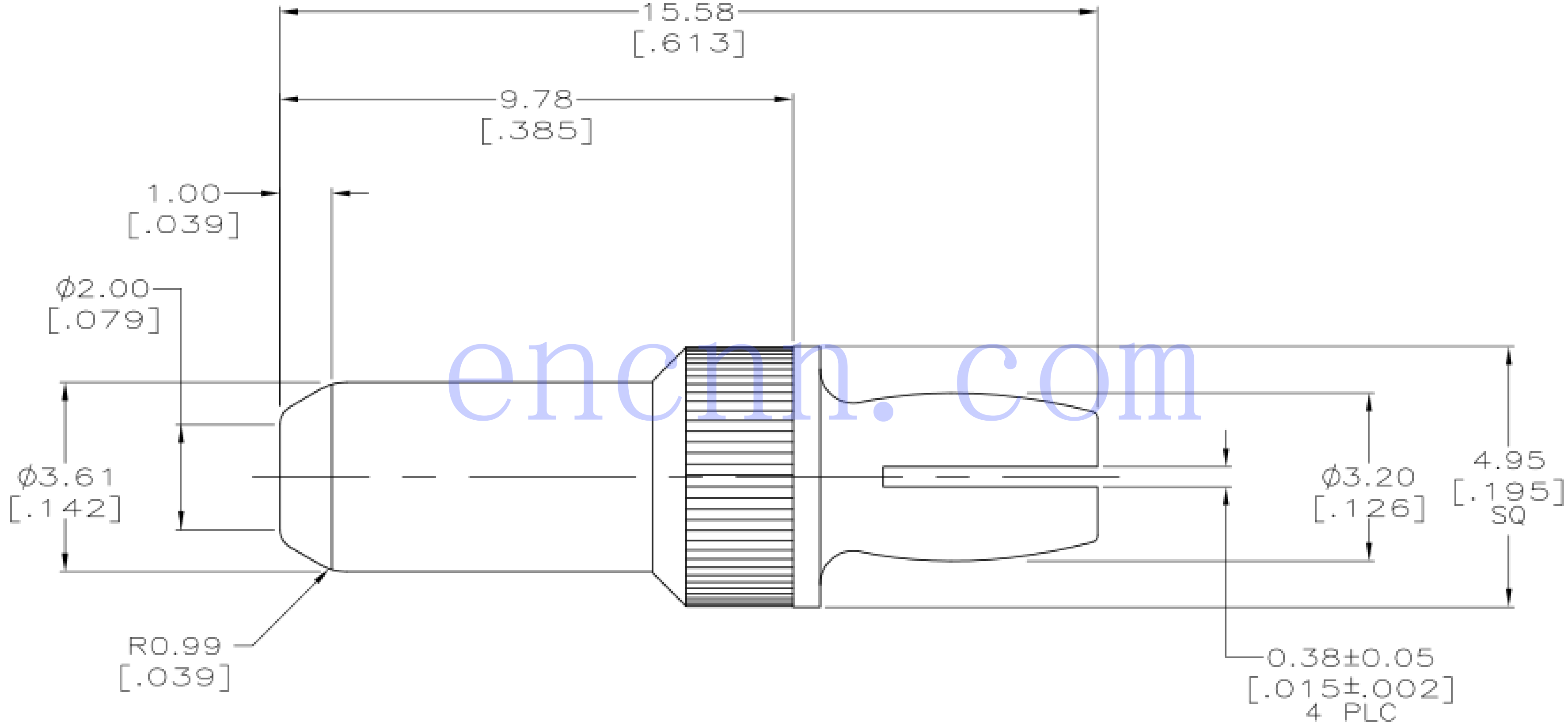


ASSEMBLY DETAIL

1. PART NUMBER CHANGES AND/OR DESIGN CHANGES AFFECTING ITEM INTERCHANGEABILITY REQUIRE PRIOR APPROVAL AND AUTHORIZATION BY REVISION TO THIS DRAWING.
2. ITEMS PROVIDED TO THIS SPECIFICATION SHALL BE IDENTIFIED ON THE CONTAINER WITH THE FOLLOWING INFORMATION: PART NUMBER & DATE CODE OF MANUFACTURE.

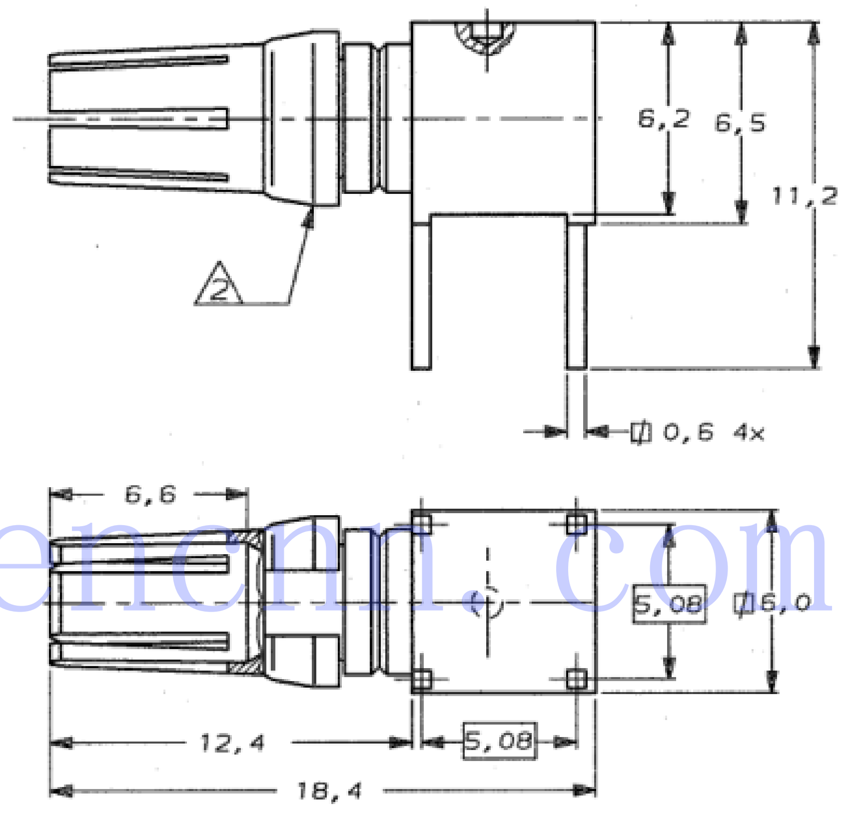
3 MATERIAL -PIN CONTACT: COPPER ALLOY
CONICAL WASHER: SPRING STEEL.

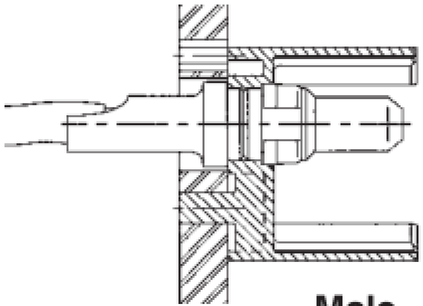
电源连接器设计


15.58
[.613]
9.78
[.385]
1.00
[.039]
Ø2.00
[.079]
Ø3.61
[.142]
R0.99
[.039]
Ø3.20
[.126]
4.95
[.195]
SQ
0.38±0.05
[.015±.002]
4 PLC

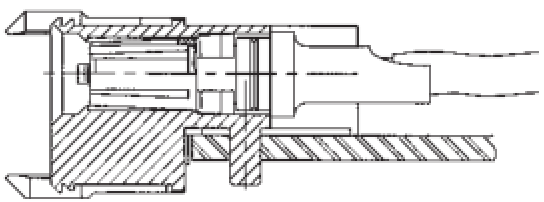
连接器设计培训系列

电源连接器设计

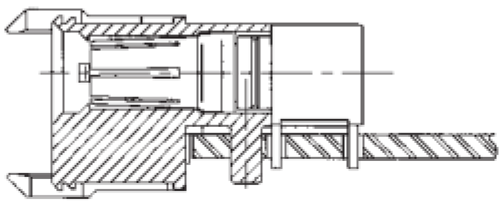




Male

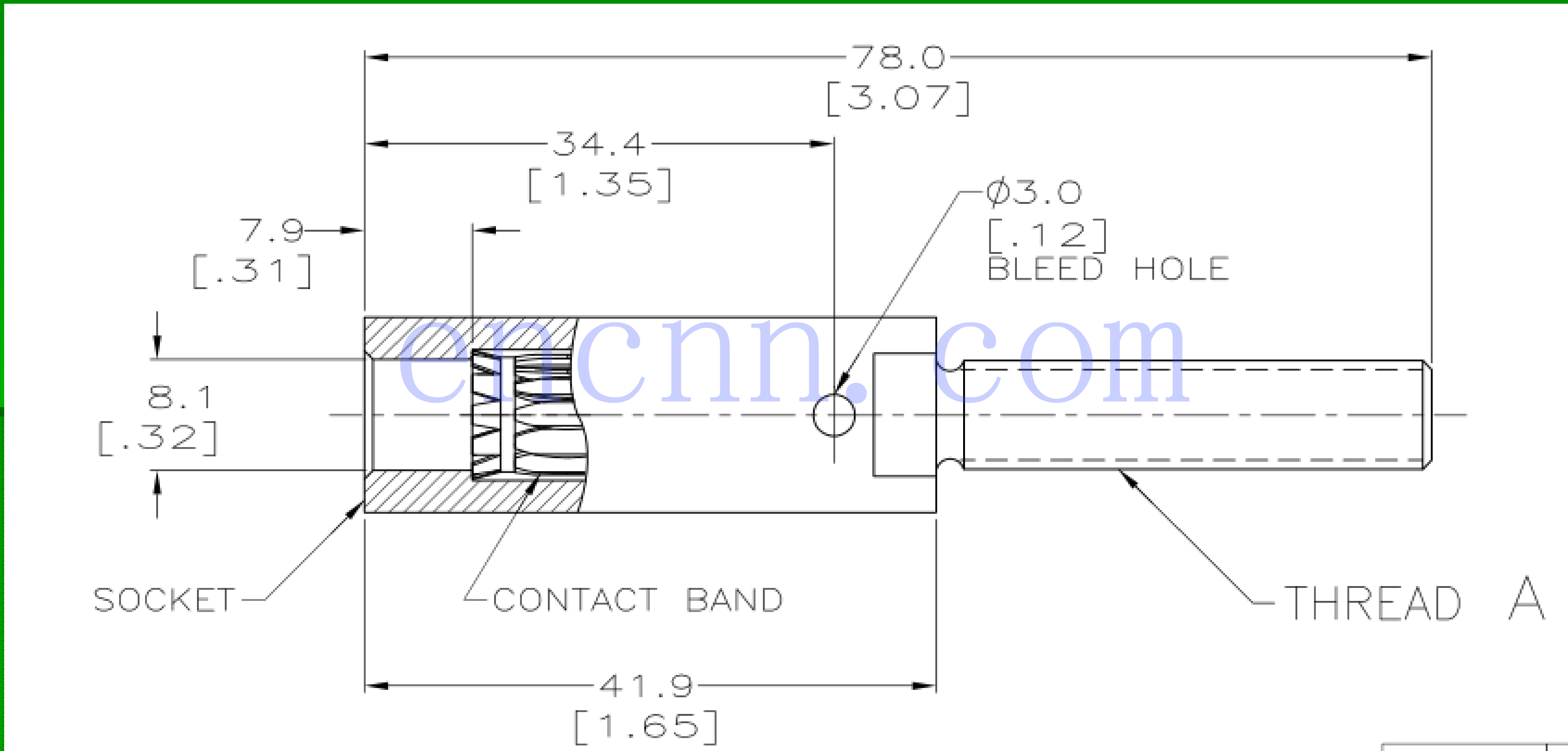


Female, Cable



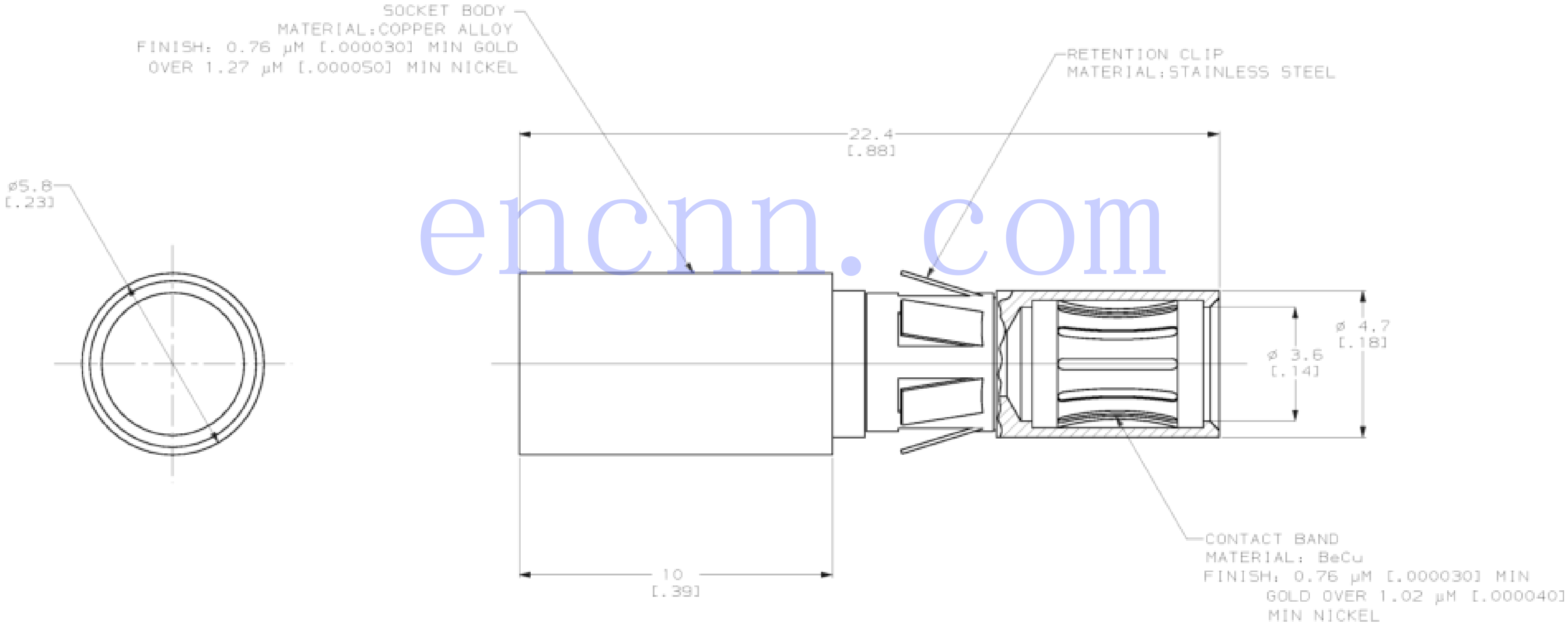
Female with Solder Pins

电源连接器设计

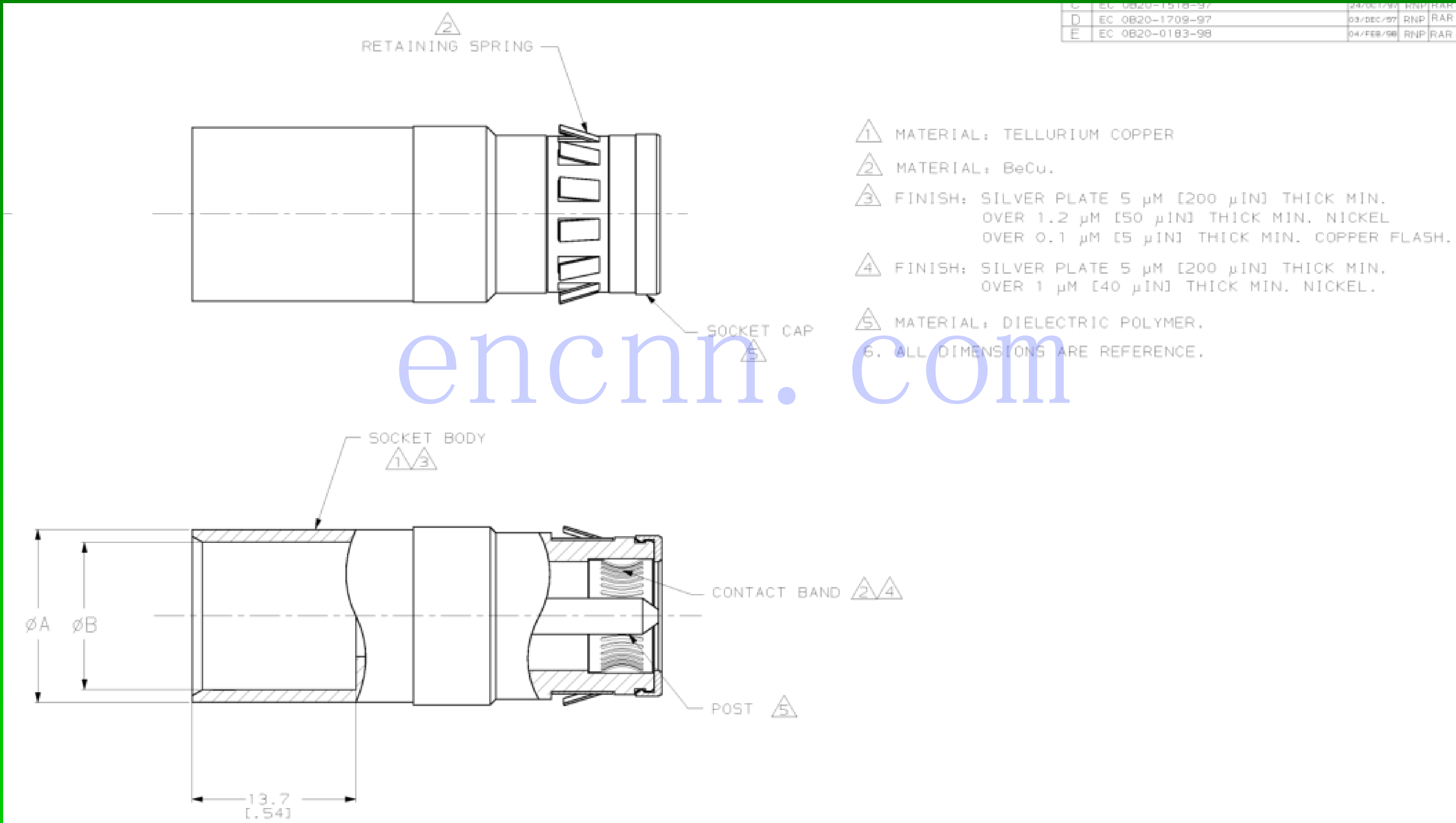

78.0
[3.07]
34.4
[1.35]
7.9
[.31]
ϕ3.0
[.12]
BLEED HOLE
8.1
[.32]
SOCKET
CONTACT BAND
THREAD A
41.9
[1.65]

电源连接器设计

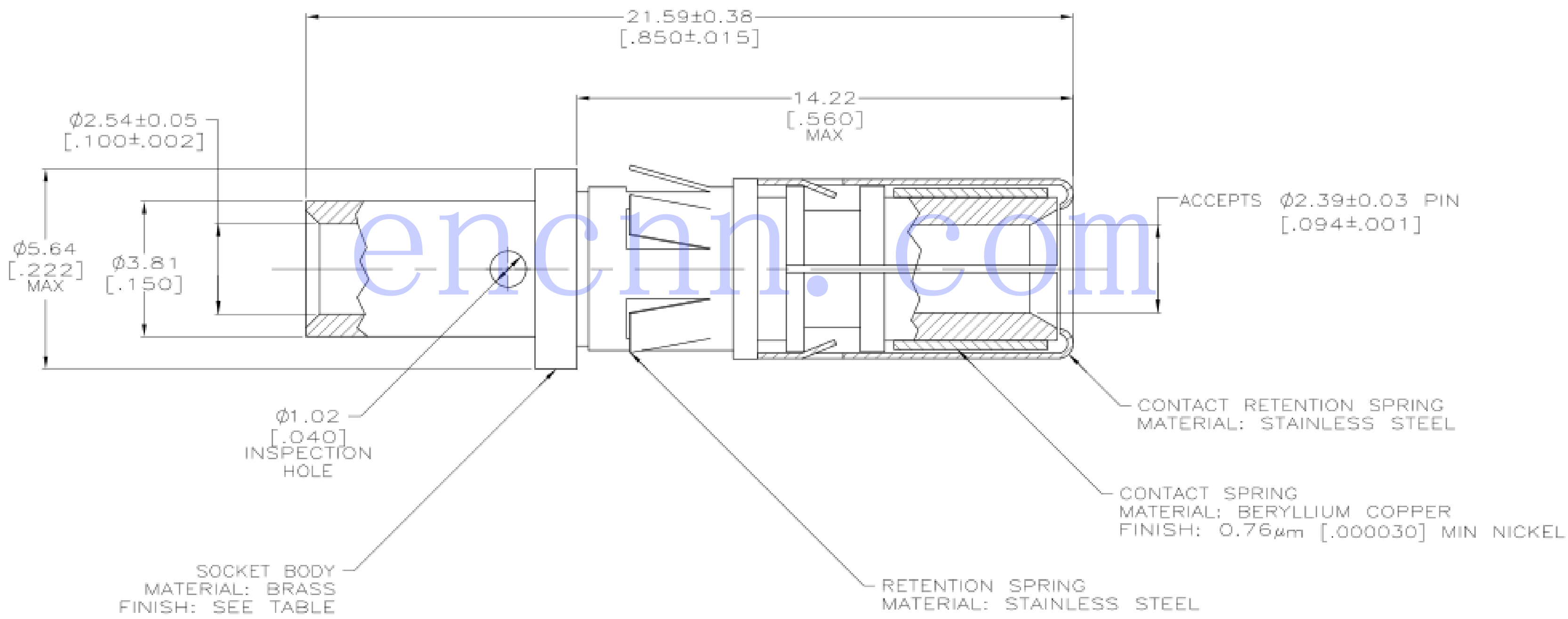
1. RETROFIT CONTACT FOR METRIMATE AND AMPLIMITE POWER CONTACT.
2. WIRE BARREL WILL ACCEPT #8 AWG WIRE.



电源连接器设计

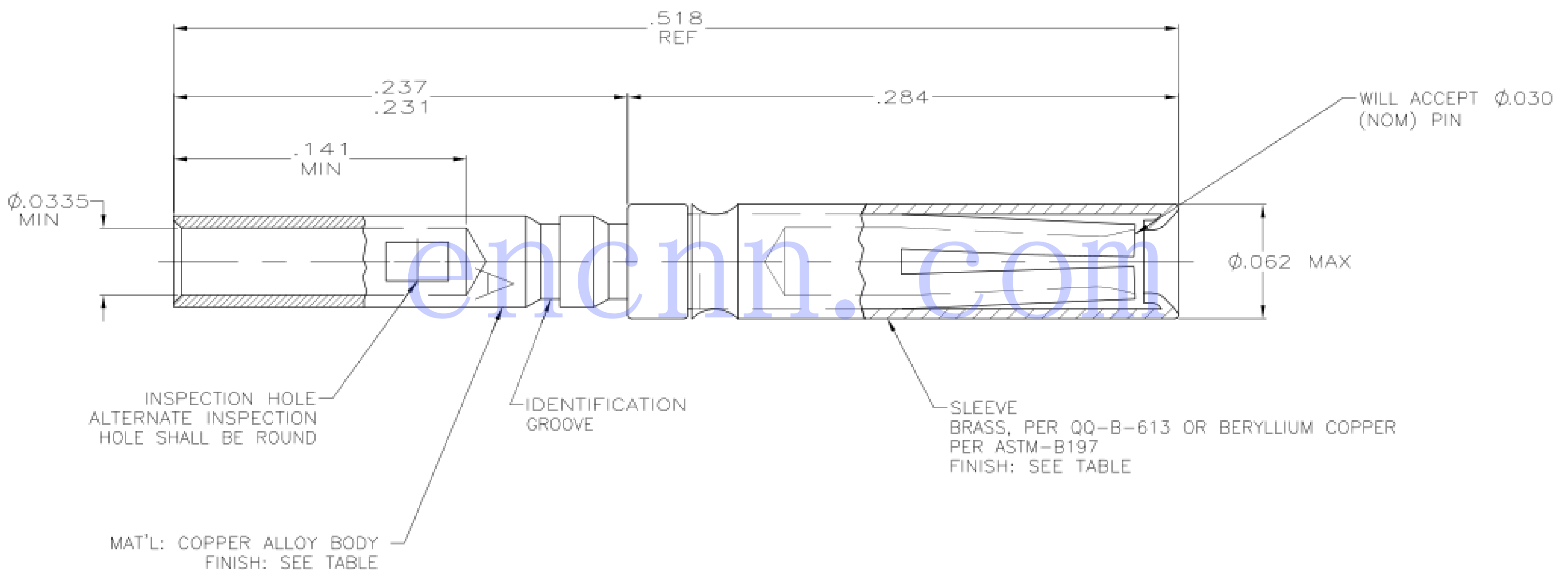

D EC 0820-1709-97 03/DEC/97 RNP RAR
E EC 0820-0183-98 04/FEB/98 RNP RAR
RETAINING SPRING 2
SOCKET CAP 5
SOCKET BODY 1 3
CONTACT BAND 2 4
POST 5
ØA
ØB
13.7
[.54]
1 MATERIAL: TELLURIUM COPPER
2 MATERIAL: BeCu.
3 FINISH: SILVER PLATE 5 μM [200 μIN] THICK MIN.
OVER 1.2 μM [50 μIN] THICK MIN. NICKEL
OVER 0.1 μM [5 μIN] THICK MIN. COPPER FLASH.
4 FINISH: SILVER PLATE 5 μM [200 μIN] THICK MIN.
OVER 1 μM [40 μIN] THICK MIN. NICKEL.
5 MATERIAL: DIELECTRIC POLYMER.
6. ALL DIMENSIONS ARE REFERENCE.

电源连接器设计



21.59±0.38
[.850±.015]
14.22
[.560]
MAX
Ø2.54±0.05
[.100±.002]
Ø5.64
[.222]
MAX
Ø3.81
[.150]
ACCEPTS Ø2.39±0.03 PIN
[.094±.001]
Ø1.02
[.040]
INSPECTION
HOLE
CONTACT RETENTION SPRING
MATERIAL: STAINLESS STEEL
CONTACT SPRING
MATERIAL: BERYLLIUM COPPER
FINISH: 0.76µm [.000030] MIN NICKEL
SOCKET BODY
MATERIAL: BRASS
FINISH: SEE TABLE
RETENTION SPRING
MATERIAL: STAINLESS STEEL

电源连接器设计



.518
REF
.237
.231
.284
.141
MIN
Ø.0335
MIN
WILL ACCEPT Ø.030
(NOM) PIN
Ø.062 MAX
INSPECTION HOLE
ALTERNATE INSPECTION
HOLE SHALL BE ROUND
IDENTIFICATION
GROOVE
SLEEVE
BRASS, PER QQ-B-613 OR BERYLLIUM COPPER
PER ASTM-B197
FINISH: SEE TABLE
MAT'L: COPPER ALLOY BODY
FINISH: SEE TABLE